ESSAYS IN EMPIRICAL MONETARY AND MACROECONOMICS

By

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The dissertation is a study of three areas of macroeconomic interest. Chapter 2 provides some empirical evidence on New Keynesian macroeconomic models that stress the role of inflexible prices by examining the period of the Nixon wage and price controls. I find that during the Nixon wage and price controls, there is some evidence that suggests that money growth innovations have larger liquidity effects. The third chapter is an analysis of the effectiveness of World Bank lending in promoting economic growth. I find that countries that receive loans do not experience growth rates statistically different from those of nonrecipient countries while controlling for other sources of growth. Chapter 4 examines the use of a statewide measure of consumer confidence, the Florida Consumer Confidence Index, in forecasting monthly automotive group sales in the state of Florida. I find that the relationship between the Florida Consumer Confidence Index breaks down during the period of the Gulf War and after, and that its component indices that reflect longer-term economic expectations are better predictors of automotive sales. In addition, I find that the Florida Consumer Confidence Index contains no additional explanitory power when used in conjunction with a national index of consumer sentiment.

CHAPTER 1

INTRODUCTION

The dissertation is a collection of work on topics of empirical macroeconomic interest. The second chapter provides some empirical evidence on New Keynesian macroeconomic models that stress the role played by "sticky," or rigid, prices. The third chapter examines the effectiveness of multilateral lending in promoting growth and convergence between developing and developed countries. The fourth chapter analyzes the use of the Florida Consumer Confidence Index in forecasting monthly taxable sales in the automotive group for the state of Florida and whether the state measure of consumer confidence provides additional information not captured by national measures of consumer confidence.

The Impact of Price Controls on Interest Rates

A substantial literature in the New Keynesian tradition has postulated an important role for rigid nominal prices. While the precise form of the menu costs that lead to prices being inflexible is often obscure, I exploit the Nixon wage and price control era to focus on a period when the costs of changing prices had to be much higher than usual. For a theoretical model, I present a variant of the ISLM framework where the aggregate price level is a weighted average of temporary fixed prices and perfectly flexible prices. This model gives the conventional New Keynesian conclusion that the liquidity effect from a monetary innovation is larger during periods of sticky prices. I test this using data from the wage and price control period, and find some evidence that suggests that money growth innovations have larger liquidity effects during a period of price control as is hypothesized in the New Keynesian model.

The Effectiveness of World Bank Lending on Growth

This chapter is an analysis of World Bank efficacy in promoting economic growth. The conventional view of multilateral lending is that these institutions allow developing countries access to capital markets, thus promoting growth via the funding of development projects that otherwise would have not been undertaken. A critical view of public lending to developing countries is that it has no impact on growth, since it displaces private lending and leads to an outflow of private capital that offsets the inflow by public lenders, or results in increased domestic government consumption.

To examine the effect of World Bank lending on growth rates, I estimate regressions on cross-country data including an effect for loan recipients. In the presence of other sources of growth, I find that loan recipients do not experience growth rates in per capita GDP statistically different from that of nonrecipient countries.

Florida Consumer Confidence and its Use in Forecasting

Since 1990, there has been renewed interest in the use of consumer confidence indices in forecasting macroeconomic fluctuations. There is no literature looking at the use of state measures of consumer confidence and its effectiveness in forecasting durable goods expenditures at the state level. I use the Florida Consumer Confidence Index and its subcomponents in forecasting models for monthly automotive group expenditures. I find that the Florida Consumer Confidence Index is a poor predictor of automotive sales, and that other economic variables are more reliable. In addition, I find that the Florida Consumer Confidence Index provides no additional explanatory power when utilized in conjunction with a national measure of consumer confidence.

CHAPTER 2

THE IMPACT OF PRICE CONTROLS ON INTEREST RATES: AN EMPIRICAL STUDY OF THE WAGE AND PRICE CONTROLS OF 1971-1974

Introduction

One of the most persistent and controversial topics in monetary economics is the nature of the relationship between the growth rate of money and nominal interest rates. While there exist other explanations such as instantaneous adjustment and buffer-stock models, the conventional theory is that changes in the growth rate of the money supply affect nominal interest rates differently over time; hence the identification of the liquidity, income and expectations effects. Initially, when the growth rate of money increases and prices are slow to adjust, real money balances rise and agents increase their demand for interest-bearing assets like bonds in an attempt to rid themselves of excess money. This, in turn, causes both the real and nominal interest rates to fall and is known as the liquidity effect. Increased money growth will lead also to a rise in nominal income as the price level begins to adjust upward. This results in the income effect: higher nominal income leads to an increased demand for money, causing interest rates to rise. Lastly, there is the expectations or Fisher effect. Over time, prices adjust upward as agents revise their expectations. At this time, increased money growth does not increase real balances as inflation rises to match the higher monetary growth. Nominal interest rates move upward with the increase in expected inflation, while real interest rates return to their original level.

Combining the above effects of money on interest rates results in the following theoretical hypothesis: in the presence of "sticky" prices and lagging inflationary expectations and money demand, money supply changes have real effects in the short run via the liquidity effect. This is the traditional Keynesian model of the short-run nonneutrality of money where real effects are generated by temporary declines in the real and nominal interest rates. There is a long history associated with this approach, as represented by Cagan and Gandolfi (1969), Darby (1975), and Melvin (1983) as notable examples. Cagan and Gandolfi produced some of the first empirical findings on the response of interest rates to money growth via regressions of interest rates on changes in money growth. They found that the liquidity effect bottomed out roughly six months after an increase in money growth. The liquidity effect was thought to be almost an empirical regularity until the early 1970s, when it was observed that the liquidity effect appeared to be vanishing.[1] Brown and Santoni (1983) look for possible structural changes in the liquidity effect dependent on whether or not the dollar was tied to the gold standard. They find that the empirical evidence is inconclusive from 1954 to 1971, and that after 1971 the liquidity effect is contemporaneous, small in magnitude and short-lived. Reichenstein (1987) reviews the empirical evidence on this phenomenon and finds that from at least 1975, the lag from money to inflationary expectations has shortened considerably. Recent work by Strongin (1991) using a VAR framework suggests that the liquidity effect is present from 1959 onward, when exogenous monetary disturbances are measured by changes in the composition of total reserves between borrowed and nonborrowed components.

With the advent of the New Keynesian approach, there is renewed focus on the role of price rigidities in macroeconomic fluctuations. While most of the New Keynesian literature has concentrated on providing a rationale for the existence of such rigidities and the extent of price inertia in individual sectors, relatively little has been done on periods of price control and their impact. Under a regime of economy-wide price controls, activist monetary policy should have greater effects for a limited time than during periods of price flexibility. If these price rigidities are important, the Lucas Critique suggests that the parameters should change when switching regimes. Empirically, a shift in parameters due to a policy change can be tested using different tests of parameter stability.

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[1] Melvin essentially replicates Cagan and Gandolfi's (1969) methodology using data through the 1970s. He finds that the liquidity effect lasted two months or less in the late 1970s.

This paper looks at the effects of money supply innovations on nominal interest rates in the presence of price controls, focusing on the empirical results arising from the Nixon wage and price control program enacted in August of 1971. The theoretical model is a variant of the ISLM framework where the aggregate price level is a weighted average of a fixed "control" price level and a flexible response to changes in the money supply. Under such a framework, I find some evidence that suggests that money growth innovations have larger liquidity effects during a period of price control as is hypothesized in the theoretical model.

The Theoretical Model

The basic model of the economy consists of

$$y = c(y) + i(r) \tag{2-1}$$

$$m - p = L(y, r) \tag{2-2}$$

$$p = \alpha\bar{p} + (1-\alpha)m \tag{2-3}$$

$$0 \le \frac{\partial c}{\partial y} \le 1;\ \frac{\partial i}{\partial r} \le 0;\ \frac{\partial L}{\partial y} \ge 0;\ \frac{\partial L}{\partial r} \le 0;\ \frac{\partial p}{\partial m} \ge 0;\ 0 \le \alpha \le 1 \quad \text{(2-4)}$$

$$m = \log(M);\quad p = \log(P) \quad \text{(2-5)}$$

The aggregate price level is a linear combination of a fixed price level and money supply effects representing price flexibility. As the degree of price rigidity increases (alpha becomes larger), the money supply has decreasing effects on the aggregate price level and increasing effects on real money balances.

Real balances under the above specification become

$$m - p = \alpha(m - \overline{p}) \quad \text{(2-6)}$$

and the change in real balances from a change in the money supply is

$$\frac{d(m-p)}{dm} = 1 - (1 - \alpha) = \alpha \ge 0. \quad \text{(2-7)}$$

The first term represents the direct effect of a change in money supply growth on the change in real balances. As money supply growth is increased, real balances grow by a factor of 1. But since an increase in the money supply raises the aggregate price level in the presence of some price flexibility, there is a secondary offsetting effect as represented by the second term. In the presence of total price flexibility (alpha=0), the two terms cancel each other and real balances remain unchanged. As a result, money supply changes do not affect real interest rates and hence investment and output when prices are totally flexible.

Evaluating real balances near the natural rate of output and setting the control price level equal to the initial price level,

$$m_o = p_o; \quad where\ \bar{p} = p_o$$

the model becomes

$$y_n = c(y_n) + i(r_n);\ m_o - p_o = L(y_n, r_n);\ p = \alpha p_o + (1-\alpha)m.$$

Totally differentiating the model around the natural rate gives:

$$\begin{bmatrix} 1-\frac{\partial c}{\partial y} & \frac{-\partial i}{\partial r} \\ \frac{\partial L}{\partial y} & \frac{\partial L}{\partial r} \end{bmatrix} \begin{bmatrix} dy \\ dr \end{bmatrix} = \begin{bmatrix} 0 \\ \alpha dm \end{bmatrix}$$

The determinant is

$$\det = (1-\frac{\partial c}{\partial y})\frac{\partial L}{\partial r} + (\frac{\partial L}{\partial y})\frac{-\partial i}{\partial r} \leq 0$$

Interest rates are negatively related to changes in money supply growth when there is a degree of price rigidity:

$$\frac{dr}{dm} = \frac{(1-\frac{\partial c}{\partial y})\alpha}{\det} \leq 0$$

The change in aggregate output for a change in money supply growth is

$$\frac{dy}{dm} = \frac{\alpha(\frac{\partial i}{\partial r})}{\det} \geq 0$$

In the presence of price controls, positive innovations in the money supply cause real money balances to rise. This leads to increased demand for interest-bearing assets which lowers real and nominal interest rates, stimulating investment and increasing aggregate output. The theoretical model suggests that during a period of price controls, the liquidity effect should be more pronounced and occur over a longer duration than non-price control liquidity effects. Using data from the Nixon wage-price control era, it is possible to test empirically whether a structural change occurred in the relationship between interest rates and money supply changes over the price control period.

The Nixon Wage-Price Controls and the Conduct of Monetary Policy

On August 15, 1971, a ninety-day freeze on all prices, wages and rents was imposed as Phase I of the Nixon administration's Economic Stabilization Program. Phase I was followed by three subsequent price control phases of varying severity: Phase II (Nov. 14, 1971-Jan. 11, 1973) allowed for prices to increase based on a percentage passthrough of allowable costs and adjusted for productivity and volume; Phase III (Jan. 11, 1973-June 13, 1973) was more flexible on price increases, but as price increases moved through the economy another price freeze was imposed from June to August of 1973; and Phase IV (Aug. 12, 1973-April 30, 1974) involved the lifting of the price freeze and placing each sector of the economy under controls, with price regulations being slightly more stringent than Phase II controls(Meyer, 1982). Deregulation of the economy increased in early 1974, and by the end of April, it was estimated that approximately 12 percent of the economy was still under price controls as opposed to an estimated 44 percent prior to decontrol (Kosters, 1975).

A question of concern is whether monetary policy significantly changed during the period of price controls. Prior to 1970, free reserves were the primary daily operations target and bank credit served as the primary intermediate target; afterward, money growth replaced bank credit as intermediate target while the federal funds rate replaced free reserves as the primary guide to daily open-market operations (Meulendyke, 1988). Though this was a formal shift in policy targets, the Federal Reserve continued to accommodate money demand through free reserves in the early 1970s and gradually shifting to tighter targeting of the federal funds rate. Strongin (1991) finds that no major structural break with regard to monetary policy occurred until later in the 1970s when the Federal Reserve switched to nonborrowed reserves targeting. Interest rate targeting regimes would tend to cause a positive bias in the coefficients on money growth in an empirical model of interest rates, thus creating the impression of no liquidity effect (Mehra, 1985) .

Empirical Model and Results

The following regressions were estimated using monthly data (CITIBASE) from January 1960 through April 1974 (full sample period), adjusted for seasonality. Then, the sample was split into two subsamples, January 1960 through July 1971 and August 1971 through April 1974, and the equations re-estimated. All results have been adjusted to control for AR(1) autocorrelation. A Chow test for structural change was performed to determine if a change in the response of interest rates to a change in money growth occurred between the two subperiods.

A. The general form of the equation of interest is

$$\Delta(r_{tb3})_t = \delta + \sum_{i=0}^{n} \beta_i \, \Delta\log(M_{t-i}) + \epsilon_t \qquad (2\text{-}8)$$

where r_{tb3} is the monthly three-month T-bill rate, M_{t-i} is a lagged measure of money, and n is the length of the monetary lag.

The three-month Treasury bill rate was used rather than the federal funds rate in order to reduce any possible bias in the coefficients that would result during periods of federal funds targeting and because prior to 1965, the federal funds market did not operate in the same fashion as in later time periods.[2] Different measures of money were utilized in the above framework. The various measures of money include total, borrowed and nonborrowed reserves, as well as monetary aggregates like the monetary base and M1. For all, I included eleven lags of the log differences of money on the right-hand side of equation 8. These regressions appear in Tables 2-1 through 2-15.

Regardless of how the money supply was measured, the Chow test results were significant, suggesting that a structural change occurred between the two subperiods. This is a little surprising since the individual coefficients on the aggregate measures like M1 and monetary base for the two subperiods are, for the most part, insignificant. The Chow test results are also affected by the fact that the disturbance variance is different between the two subsample periods, which would cause an over-estimation of the significance level of the test statistic (i.e., a Type I error). The likelihood ratio test for heteroscedasticity across the two subperiods is significant for all Chow tests performed, so a test that accounts for heteroscedasticity must be used. To accommodate for this problem, the Wald Test for Structural Change is also cited.[3] The question of whether liquidity effects are present across both subperiods is also dependent on which money measure is utilized in the analysis as well as the overall low significance of the coefficients on the changes in money growth. Each table summarizes the empirical results for the full sample period and for the two subsample periods for all the various money growth measures.

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[2] See Meulendyke (1989) or Strongin (1991) for a discussion of reserve management and the federal funds rate.

For aggregate measure M1 during the full sample period, none of the individual coefficients on the growth rate innovations appears to be particularly significant, yet the joint test on the sum of the coefficients is significantly different from zero at the 1 percent level. In the case of

---

[3] The Wald Test for Structural Change is

$$W = (\theta_1^* - \theta_2^*)'(V_1 + V_2)^{-1}(\theta_1^* - \theta_2^*)$$

where the null hypothesis is that the parameters are equal across the two subperiods.

the monetary base, some coefficients are significant at the 5 percent level, yet the sum of the coefficients is insignificant. Changes in the growth rate in M1 for the seventh month is significant at the 5 percent level and is positive in sign. A 1 percent monthly increase in the M1 growth rate is estimated to cause a 0.18 basis point increase in the three month T-bill rate above its mean. This suggests there was no liquidity effect due to M1 growth rate changes for the full sample period.

Out of the various reserve measures, only borrowed and nonborrowed reserves have individual coefficients and the sum of the lag coefficients that both appear significant. The coefficients on borrowed reserve growth are positive and suggest that for a 1 percent change in the growth rate of borrowed reserves, there is a increase in the T-bill rate of 0.85 basis points over mean. The first two lags of changes in nonborrowed reserve growth are significant at the 5 percent level and are negative, which support the existence of a two-month liquidity effect over the entire sample period. The growth rate innovation from one year prior also is highly significant and negative for nonborrowed reserves. For a 1 percent change in the growth of nonborrowed reserves, the T-bill rate falls on average by 19.03 basis points. Total reserves seem to suffer from the same problems as cited for monetary base above. The coefficients on total reserve growth do not appear significant except for the eighth and eleventh lag, and the sum of the coefficients is not significant.

Looking at the regression results for the two subsamples, we find that for the monetary aggregates, M1 and monetary base, a few of the coefficients on changes in the money growth rate are close to being significant at the 5 percent level in the first subsample (1961:2-1971:7).[4] In the second subsample (1971:8-1974:4), none of the coefficients on the money growth terms is significant. The Wald Test suggests that no structural change occurred with the imposition of price controls in either of the two specifications.[5] None of the different reserve measures have tests for the sum of the money growth coefficients that are significant in the first subsample, though borrowed reserves and total reserves do have a few significant individual coefficients. In the second subperiod (1971:8-1974:4), nonborrowed and borrowed reserves both have coefficients that are significant, as are the sums of the reserve coefficients. A 1 percent increase in the growth rate of borrowed reserves leads to an estimated increase of 1.03 basis points over mean in the second subsample; and for nonborrowed reserves, a 1 percent increase in the growth rate results in a estimated decrease of 54 basis points in the second subperiod.[6] The Wald Test for structural change is insignificant for borrowed and total reserve growth changes, suggesting that no structural break occurred. For nonborrowed reserve growth innovations, however, the Wald test is significant at the 5 percent level and implies that a differential liquidity effect is present.

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[4] The test of joint significance for the sum of the money growth coefficients is significant at the 5 percent level for M1, and is insignificant for the monetary base.

[5] W=14.69, p-value=0.32 for M1, and W=11.57, p-value=0.56 for monetary base.

The most interesting results from the empirical analysis are those for nonborrowed reserves. As stated earlier, positive innovations in nonborrwed reserve growth lead to declines in the 3-month T-bill rate for the full sample period and the price control period. There does exist a difference in the timing and magnitude of the liquidity effect between the period prior to price controls and the period during price controls. Prior to the imposition of price controls, the liquidity effect was smaller in magnitude and statistically insignificant, and seemed to occur with a lag of one month; that is, the current month's innovation in nonborrowed reserve growth did not have as much of an impact as last month's change. During the period of price controls, the liquidity effect was much larger, statistically significant and occurred with greater duration, with most of the effect coming from the first two months' innovations in the growth rate. This supports the intuition that the liquidity effect should have a longer duration over the price control period.

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[6] For the pre-price control period, the effect of a 1 percent increase in borrowed and nonborrowed reserve growth on the three-month T-bill rate is not significantly different from zero. During price controls, the effect is significant with t-statistics of 2.6 and -2.9, respectively.

Conclusions

Based on the above empirical results, it appears that nonborrowed reserve growth indicates a significantly larger liquidity effect during the price control period than during the prior years. The other money growth measures that were examined for possible effects do not seem particularly significant across both subperiods, most likely due to multicollinearity between the lagged terms. Another possible money measure to consider would be free reserves, as well as including discount rate changes in the model. It has been suggested that free reserves are "more exogenous" than nonborrowed reserves.

TABLE 2-1: Nonborrowed Reserves: Full Sample Period

Current sample: 1961:2 to 1974:4
Number of observations: 159

R-squared = 0.15807
Adjusted R-squared = 0.08887
Durbin-Watson statistic = 2.00288
Rho (autocorrelation coef.) = 0.22629
Standard error of rho = 0.08065
t-statistic for rho = 2.80557
F-statistic (zero slopes) = 2.28425

Variable	Estimated Coefficient	Standard Error	t-stat	P-value
C	0.08408	0.036404	2.30962	* [.021]
DNBR	-5.32462	2.02097	-2.63468	** [.008]
DNBR(-1)	-4.65169	2.07298	-2.24396	* [.025]
DNBR(-2)	0.29896	2.07384	0.14416	[.885]
DNBR(-3)	-3.32612	2.08431	-1.59579	[.111]
DNBR(-4)	-0.68844	2.08325	-0.33047	[.741]
DNBR(-5)	-3.02407	2.09675	-1.44226	[.149]
DNBR(-6)	-0.82299	2.09214	-0.39337	[.694]
DNBR(-7)	0.10124	2.12846	0.04756	[.962]
DNBR(-8)	2.24733	2.13783	1.05122	[.293]
DNBR(-9)	2.50806	2.16145	1.16036	[.246]
DNBR(-10)	0.54434	2.17123	0.25071	[.802]
DNBR(-11)	-6.89407	2.12932	-3.23769	** [.001]
Sum	-19.03	9.694	-1.963	

Chow Test for Structural Change=5.04336 (0.000)**
LR Test for Chow test Heteroskedasticity=57.43104 (0.000)**
Wald Test for Structural Change=24.12167 (0.02923)*

All coefficients are in basis points.

TABLE 2-2: Nonborrowed Reserves: Pre-price Control Period

Current sample: 1961:2 to 1971:7
Number of observations: 126

R-squared = 0.14041
Adjusted R-squared = 0.04919
Durbin-Watson statistic = 1.78364
Rho (autocorrelation coef.) = 0.52113
Standard error of rho = 0.08367
t-statistic for rho = 6.22845
F-statistic (zero slopes) = 1.53805 [.121]

Variable	Estimated Coefficient	Standard Error	t-stat	P-value
C	0.044836	0.047018	0.953600	[.340]
DNBR	-1.99378	1.81424	-1.09896	[.272]
DNBR(-1)	-2.91871	2.01002	-1.45208	[.146]
DNBR(-2)	-0.24140	2.06115	-0.117118	[.907]
DNBR(-3)	-2.40375	2.03674	-1.18020	[.238]
DNBR(-4)	2.17947	2.01375	1.08229	[.279]
DNBR(-5)	-2.83855	1.99649	-1.42177	[.155]
DNBR(-6)	-2.15669	1.98644	-1.08571	[.278]
DNBR(-7)	0.89653	1.98784	0.451006	[.652]
DNBR(-8)	2.35100	1.99291	1.17968	[.238]
DNBR(-9)	2.91618	2.00027	1.45789	[.145]
DNBR(-10)	-0.05161	1.98411	-0.026012	[.979]
DNBR(-11)	-2.08703	1.80833	-1.15412	[.248]
Sum	-6.348	11.91	-0.5332	

All coefficients are in basis points.

TABLE 2-3: Nonborrowed Reserves: Price Control Period

Current sample: 1971:8 to 1974:4
Number of observations: 33

R-squared = 0.616798
Adjusted R-squared = 0.386877
Durbin-Watson statistic = 2.05699
Rho (autocorrelation coef.) = -0.141023
Standard error of rho = 0.219838
t-statistic for rho = -0.641486
F-statistic (zero slopes) = 2.68256 * [.025]

Variable	Estimated Coefficient	Standard Error	t-stat		P-value
C	0.2703	0.07622	3.54683	**	[.000]
DNBR	-10.8115	5.19883	-2.07960	*	[.038]
DNBR(-1)	-14.8773	5.63527	-2.64004	**	[.008]
DNBR(-2)	-0.7275	5.28346	-0.13770		[.890]
DNBR(-3)	-11.9834	5.80381	-2.06475	*	[.039]
DNBR(-4)	-0.5220	5.74444	-0.09088		[.928]
DNBR(-5)	-4.2109	5.69587	-0.73929		[.460]
DNBR(-6)	6.4655	5.66844	1.14062		[.254]
DNBR(-7)	5.8328	6.04916	0.96423		[.335]
DNBR(-8)	7.5077	5.94992	1.26181		[.207]
DNBR(-9)	-3.7673	6.44681	-0.58437		[.559]
DNBR(-10)	-0.4357	6.58959	-0.06612		[.947]
DNBR(-11)	-26.4651	6.61604	-4.00015	**	[.000]
Sum	-53.99	18.75	-2.879		

All coefficients are in basis points.

TABLE 2-4: Borrowed Reserves: Full Sample Period

Current sample: 1961:2 to 1974:4
Number of observations: 159

R-squared = .189179
Adjusted R-squared = .122537
Durbin-Watson statistic = 1.99211
Rho (autocorrelation coef.) = .130780
Standard error of rho = .082031
t-statistic for rho = 1.59428
F-statistic (zero slopes) = 2.83871

Variable	Estimated Coefficient	Standard Error	t-stat		P-value
C	0.025773	.024871	1.03627		[.300]
DBR	0.280452	.068596	4.08847	**	[.000]
DBR(-1)	0.236752	.067595	3.50249	**	[.000]
DBR(-2)	0.011027	.067846	0.16253		[.871]
DBR(-3)	0.024541	.068164	0.36003		[.719]
DBR(-4)	0.060793	.067959	0.89455		[.371]
DBR(-5)	0.730282E-03	.065983	0.01107		[.991]
DBR(-6)	0.035921	.065971	0.54449		[.586]
DBR(-7)	0.090544	.068052	1.33052		[.183]
DBR(-8)	-0.014774	.068111	-.21690		[.828]
DBR(-9)	-0.250542E-02	.067425	-.03716		[.970]
DBR(-10)	0.437557E-02	.066664	0.065637		[.948]
DBR(-11)	0.120072	.067396	1.78160		[.075]
Sum	0.8479	0.2498	3.395		

Chow Test for Structural Change=2.19967 (0.01266)*
LR Test for Chow test Heteroskedasticity=39.56981 (0.000)**
Wald Test for Structural Change=8.98903 (0.77377)

All coefficients are in basis points.

TABLE 2-5: Borrowed Reserves: Pre-price Control Period

Current sample: 1961:2 to 1971:7
Number of observations: 126

R-squared = 0.142023
Adjusted R-squared = 0.050910
Durbin-Watson statistic = 1.83285
Rho (autocorrelation coef.) = 0.432422
Standard error of rho = 0.085629
t-statistic for rho = 5.04995
F-statistic (zero slopes) = 1.55867 [.114]

Variable	Estimated Coefficient	Standard Error	t-stat		P-value
C	0.020717	.031579	0.65605		[.512]
DBR	0.150672	.069958	2.15374	*	[.031]
DBR(-1)	0.263370	.072384	3.63853	**	[.000]
DBR(-2)	0.089119	.074476	1.19662		[.231]
DBR(-3)	0.079426	.075983	1.04531		[.296]
DBR(-4)	-0.059419	.075944	-.78241		[.434]
DBR(-5)	0.010597	.075448	0.14045		[.888]
DBR(-6)	-0.019440	.075720	-.25674		[.797]
DBR(-7)	0.899854E-02	.075840	0.11865		[.906]
DBR(-8)	-0.068311	.075985	-.89900		[.369]
DBR(-9)	-0.048060	.076808	-.62571		[.532]
DBR(-10)	-0.035796	.074480	-.48062		[.631]
DBR(-11)	0.028640	.072755	0.39365		[.694]
Sum	0.3998	0.3502	1.142		

All coefficients are in basis points.

TABLE 2-6: Borrowed Reserves: Price Control Period

```
 Current sample:  1971:8 to 1974:4
 Number of observations:  33

                  R-squared = 0.425578
         Adjusted R-squared = 0.080925
    Durbin-Watson statistic = 1.96901
Rho (autocorrelation coef.) = -.198983
      Standard error of rho = 0.216768
        t-statistic for rho = -.917952
  F-statistic (zero slopes) = 1.23473 [.327]


           Estimated     Standard
Variable  Coefficient     Error          t-stat     P-value
C          0.048359      .070181        0.68907       [.491]
DBR        0.454555      .209646        2.16820     * [.030]
DBR(-1)    0.184208      .252449        0.72968       [.466]
DBR(-2)    -.031412      .273234        -.11497       [.908]
DBR(-3)    -.034326      .256824        -.13366       [.894]
DBR(-4)    0.244285      .230444        1.06006       [.289]
DBR(-5)    -.102620      .224805        -.45649       [.648]
DBR(-6)    0.194639      .222260        0.87573       [.381]
DBR(-7)    0.156634      .220009        0.71194       [.476]
DBR(-8)    0.421933E-02  .219702        0.01921       [.985]
DBR(-9)    -.012633      .222444        -.05679       [.955]
DBR(-10)   0.049238      .211985        0.23227       [.816]
DBR(-11)   0.195259      .180611        1.08110       [.280]

-----------------------------------------------------------
 Sum          1.302      0.4986          2.612
```

All coefficients are in basis points.

TABLE 2-7: Total Reserves: Full Sample Period

```
 Current sample:  1961:2 to 1974:4
 Number of observations:  159

                    R-squared = 0.117092
          Adjusted R-squared = 0.044524
     Durbin-Watson statistic = 1.99928
 Rho (autocorrelation coef.) = 0.289534
        Standard error of rho = 0.079253
          t-statistic for rho = 3.65329
   F-statistic (zero slopes) = 1.61355

            Estimated      Standard
Variable   Coefficient      Error           t-stat    P-value
C           -.035264       0.05727         -.61574     [.538]
DTR         3.61711        2.95571         1.22377     [.221]
DTR(-1)     6.17641        3.16738         1.95001     [.051]
DTR(-2)     5.15695        3.23561         1.59381     [.111]
DTR(-3)    -1.22193        3.24289         -.37680     [.706]
DTR(-4)     2.70562        3.23380          .83667     [.403]
DTR(-5)      .77378        3.23627          .23910     [.811]
DTR(-6)     4.69550        3.23285         1.45243     [.146]
DTR(-7)     2.42436        3.21474          .75414     [.451]
DTR(-8)     6.75549        3.22934         2.09191    *[.036]
DTR(-9)     3.43261        3.24938         1.05639     [.291]
DTR(-10)     .54217        3.19033          .16994     [.865]
DTR(-11)   -7.85282        2.98294         -2.6326   **[.008]

     ------------------------------------------------------------
Sum          27.21          17.55           1.550

Chow Test for Structural Change=3.79717 (0.00003)**
LR Test for Chow test Heteroskedasticity=53.97655 (0.000)**
Wald Test for Structural Change=15.43163 (0.28119)
```

All coefficients are in basis points.

TABLE 2-8: Total Reserves: Pre-price Control Period

Current sample: 1961:2 to 1971:7
Number of observations: 126

R-squared = 0.139651
Adjusted R-squared = 0.048287
Durbin-Watson statistic = 1.85573
Rho (autocorrelation coef.) = 0.549208
Standard error of rho = 0.080702
t-statistic for rho = 6.80534
F-statistic (zero slopes) = 1.52843 [.124]

Variable	Estimated Coefficient	Standard Error	t-stat	P-value
C	-.02648	0.06560	-0.40126	[.688]
DTR	2.35936	2.45639	0.96045	[.337]
DTR(-1)	4.58505	2.93690	1.56118	[.118]
DTR(-2)	6.69059	3.22051	2.07750	* [.038]
DTR(-3)	0.19666	3.21294	0.06121	[.951]
DTR(-4)	2.67419	3.21622	0.83147	[.406]
DTR(-5)	-2.03955	3.16867	-0.64366	[.520]
DTR(-6)	2.68239	3.17513	0.84481	[.398]
DTR(-7)	5.51687	3.18139	1.73411	[.083]
DTR(-8)	4.09934	3.18183	1.28836	[.198]
DTR(-9)	2.78254	3.21108	0.86655	[.386]
DTR(-10)	-2.43532	2.95054	-0.82538	[.409]
DTR(-11)	-2.33780	2.46597	-0.94802	[.343]
Sum	24.77	22.51	1.101	

All coefficients are in basis points.

TABLE 2-9: Total Reserves: Price Control Period

Current sample: 1971:8 to 1974:4
Number of observations: 33

R-squared = 0.455400
Adjusted R-squared = 0.128641
Durbin-Watson statistic = 2.05742
Rho (autocorrelation coef.) = 0.231878
Standard error of rho = 0.212810
t-statistic for rho = 1.08960
F-statistic (zero slopes) = 1.39360 [.247]

Variable	Estimated Coefficient	Standard Error	t-stat	P-value
C	-0.13304	0.2938	-.38568	[.700]
DTR	18.3544	11.8911	1.54354	[.123]
DTR(-1)	5.69920	12.0458	.47313	[.636]
DTR(-2)	1.57303	12.3529	.12734	[.899]
DTR(-3)	-5.93167	13.6089	-.43587	[.663]
DTR(-4)	12.6106	12.8070	.98467	[.325]
DTR(-5)	10.6340	13.3306	.79771	[.425]
DTR(-6)	9.61928	12.1095	.79436	[.427]
DTR(-7)	-1.58819	12.3103	-.12901	[.897]
DTR(-8)	10.9147	13.2629	.82295	[.411]
DTR(-9)	8.72445	14.0793	.61967	[.535]
DTR(-10)	10.8085	14.5208	.74434	[.457]
DTR(-11)	-31.4658	13.3732	-2.35291	*[.019]
Sum	49.95	63.36	0.7884	

All coefficients are in basis points.

TABLE 2-10: M1: Full Sample Period

Current sample: 1961:2 to 1974:4
Number of observations: 159

R-squared = 0.089246
Adjusted R-squared=0.014389
Durbin-Watson statistic = 2.03152
Rho (autocorrelation coef.) = 0.247611
Standard error of rho = 0.080326
t-statistic for rho = 3.08257
F-statistic (zero slopes) = 1.19220

Variable	Estimated Coefficient	Standard Error	t-stat		P-value
C	-.098019	.062768	-1.56162		[.118]
DM1	.037547	.037520	1.00072		[.317]
DM1(-1)	.030070	.037811	.79528		[.426]
DM1(-2)	.018259	.037696	.48436		[.628]
DM1(-3)	-.044656	.037765	-1.18246		[.237]
DM1(-4)	-.026668	.037703	-.70733		[.479]
DM1(-5)	-.556373E-03	.038338	-.01451		[.988]
DM1(-6)	.023313	.038275	.60910		[.542]
DM1(-7)	.074068	.037777	1.96067	*	[.050]
DM1(-8)	.017114	.038043	.44985		[.653]
DM1(-9)	-.408386E-02	.038070	-.10727		[.915]
DM1(-10)	.033816	.038046	.88881		[.374]
DM1(-11)	.024530	.038077	.64423		[.519]
Sum	0.1828	0.7262E-01	2.516		

Chow Test for Structural Change=3.23330 (0.00029)**
LR Test for Chow test Heteroskedasticity=52.20282 (0.000)**
Wald Test for Structural Change=14.68622 (0.32735)

All coefficients are in basis points.

TABLE 2-11: M1: Pre-price Control Period
Current sample: 1961:2 to 1971:7
Number of observations: 126

R-squared = .122400
Adjusted R-squared = .029204
Durbin-Watson statistic = 1.92882
Rho (autocorrelation coef.) = .486441
Standard error of rho = .084426
t-statistic for rho = 5.76172
F-statistic (zero slopes) = 1.31314 [.221]

Variable	Estimated Coefficient	Standard Error	t-stat	P-value
C	-.086272	.074900	-1.15182	[.249]
DM1	.056490	.033899	1.66641	[.096]
DM1(-1)	-.672977E-02	.036056	-0.18665	[.852]
DM1(-2)	-.047720	.035699	-1.33676	[.181]
DM1(-3)	-.067539	.037291	-1.81114	[.070]
DM1(-4)	.026253	.037714	0.69612	[.486]
DM1(-5)	.038712	.038074	1.01675	[.309]
DM1(-6)	.013587	.037487	0.36245	[.717]
DM1(-7)	.076261	.037439	2.03692	*[.042]
DM1(-8)	.049977	.037303	1.33974	[.180]
DM1(-9)	.045063	.035990	1.25210	[.211]
DM1(-10)	.017120	.035775	0.47855	[.632]
DM1(-11)	-.307307E-02	.033692	-0.09121	[.927]
Sum	0.1984	0.1083	1.832	

All coefficients are in basis points.

TABLE 2-12: M1: Price Control Period

```
 Current sample:  1971:8 to 1974:4
 Number of observations:  33

                    R-squared =  .405114
           Adjusted R-squared =  .048183
       Durbin-Watson statistic = 1.78778
 Rho (autocorrelation coef.) = -.157512
         Standard error of rho =  .227414
           t-statistic for rho = -.692622
   F-statistic (zero slopes) = 1.13482 [.388]

            Estimated    Standard
Variable  Coefficient     Error          t-stat    P-value
C          -1.08585      .506394      -2.14428 *  [.032]
DM1          .023895     .152814        .15636    [.876]
DM1(-1)      .162043     .218066        .74309    [.457]
DM1(-2)      .056725     .254103        .22323    [.823]
DM1(-3)      .193845     .244835        .79174    [.429]
DM1(-4)     -.123463     .237611       -.51960    [.603]
DM1(-5)      .149029     .230464        .64665    [.518]
DM1(-6)      .075240     .229597        .32770    [.743]
DM1(-7)      .025145     .233007        .10792    [.914]
DM1(-8)      .262467     .241293       1.08776    [.277]
DM1(-9)     -.253679     .241404      -1.05085    [.293]
DM1(-10)     .349590     .212515       1.64501    [.100]
DM1(-11)    -.034269     .162451       -.21095    [.833]

----------------------------------------------------------
 Sum        0.8866       0.3776          2.348
```

All coefficients are in basis points.

TABLE 2-13: Monetary Base: Full Sample Period

```
 Current sample:  1961:2 to 1974:4
 Number of observations:  159

                  R-squared = .150205
         Adjusted R-squared = .080359
     Durbin-Watson statistic = 1.98760
 Rho (autocorrelation coef.) = .269011
       Standard error of rho = .079800
         t-statistic for rho = 3.37109
   F-statistic (zero slopes) = 2.15048


            Estimated     Standard
 Variable  Coefficient     Error          t-stat   P-value
 C         -.039463      .063612        -.62038    [.535]
 DMB       -.985045E-04  .146088E-03    -.67428    [.500]
 DMB(-1)   .308854E-03   .143760E-03    2.14840   *[.032]
 DMB(-2)   .185618E-03   .142288E-03    1.30452    [.192]
 DMB(-3)   -.485766E-04  .142877E-03    -.33999    [.734]
 DMB(-4)   -.234358E-04  .144691E-03    -.16197    [.871]
 DMB(-5)   .425632E-04   .145233E-03    .293068    [.769]
 DMB(-6)   .325346E-03   .147966E-03    2.19878   *[.028]
 DMB(-7)   .114432E-03   .150518E-03    .760256    [.447]
 DMB(-8)   .162037E-03   .150777E-03    1.07468    [.283]
 DMB(-9)   -.306393E-03  .153629E-03    -1.9944   *[.046]
 DMB(-10)  -.284824E-04  .153376E-03    -.18570    [.853]
 DMB(-11)  -.370751E-03  .156496E-03    -2.3691   *[.018]

-------------------------------------------------------
  Sum         0.2627E-03     0.2210E-03     1.189
```

Chow Test for Structural Change=2.76103 (0.00167)**
LR Test for Chow test Heteroskedasticity=42.03939 (0.000)**
Wald Test for Structural Change=11.57420 (0.56283)

All coefficients are in basis points.

TABLE 2-14: Monetary Base: Pre-price Control Period

```
 Current sample:  1961:2 to 1971:7
 Number of observations:  126

                  R-squared = .107258
         Adjusted R-squared = .012454
     Durbin-Watson statistic = 1.91010
 Rho (autocorrelation coef.) = .522602
       Standard error of rho = .081255
         t-statistic for rho = 6.43161
   F-statistic (zero slopes) = 1.13123 [.342]


           Estimated     Standard
 Variable  Coefficient    Error        t-stat     P-value
 C        -.973781E-02  .090213      -.10794     [.914]
 DMB       .115249E-03  .150326E-03   .76666     [.443]
 DMB(-1)   .136921E-03  .153887E-03   .88975     [.374]
 DMB(-2)   .219362E-04  .150797E-03   .14547     [.884]
 DMB(-3)  -.223152E-03  .154566E-03 -1.44373     [.149]
 DMB(-4)   .152744E-03  .155728E-03   .98084     [.327]
 DMB(-5)   .561287E-04  .156505E-03   .35864     [.720]
 DMB(-6)   .225489E-03  .157562E-03  1.43111     [.152]
 DMB(-7)   .301706E-03  .160495E-03  1.87984     [.060]
 DMB(-8)   .233896E-04  .162639E-03   .14381     [.886]
 DMB(-9)  -.164248E-03  .160197E-03 -1.02529     [.305]
 DMB(-10) -.345790E-03  .161145E-03 -2.14583    *[.032]
 DMB(-11) -.152669E-03  .156209E-03  -.97734     [.328]
     -------------------------------------------------------
Sum         0.1477E-03   0.4040E-03     0.3656
```

All coefficients are in basis points.

TABLE 2-15: Monetary Base: Price Control Period

```
 Current sample:  1971:8 to 1974:4
 Number of observations:  33

                  R-squared = .428187
         Adjusted R-squared = .085099
    Durbin-Watson statistic = 1.87949
 Rho (autocorrelation coef.) = .255858E-02
       Standard error of rho = .231921
         t-statistic for rho = .011032
   F-statistic (zero slopes) = 1.24804 [.319]


            Estimated     Standard
 Variable  Coefficient     Error          t-stat     P-value
 C          -.631009     .491752       -1.28318       [.199]
 DMB        -.247818E-03 .378286E-03    -.65511       [.512]
 DMB(-1)     .523829E-03 .383263E-03    1.36676       [.172]
 DMB(-2)     .633920E-03 .389702E-03    1.62668       [.104]
 DMB(-3)     .172428E-03 .373494E-03     .46166       [.644]
 DMB(-4)    -.223326E-03 .378328E-03    -.59030       [.555]
 DMB(-5)     .177230E-03 .393512E-03     .45038       [.652]
 DMB(-6)     .604839E-03 .433026E-03    1.39677       [.162]
 DMB(-7)     .323855E-03 .486023E-03     .66634       [.505]
 DMB(-8)     .145892E-03 .487525E-03     .29925       [.765]
 DMB(-9)    -.378967E-03 .456444E-03    -.83026       [.406]
 DMB(-10)    .465169E-03 .475396E-03     .97849       [.328]
 DMB(-11)   -.651745E-03 .449103E-03   -1.45121       [.147]

 -----------------------------------------------------------
 Sum         0.1545E-02   0.1077E-02      1.435
```

All coefficients are in basis points.

CHAPTER 3
THE EFFECTIVENESS OF WORLD BANK LENDING IN DETERMINING GROWTH

Introduction

As the developed nations have fallen on hard times, the development assistance provided by the World Bank and other development banks has come under closer scrutiny. Assessing the impact of external public lending on the growth rate of developing countries is an issue of importance to both economists and policy makers. The cited goal of multilateral institutions like the World Bank is to provide development assistance to those countries that cannot find private financing. In the scheme of project lending, this amounts to funding projects with low rates of return in a free market or projects that have the qualities of public goods. This "conventional" view of multilateral lending implies that access to external finance will increase a country's growth rate.

A major criticism levied against the "conventional" approach is the potential for "crowding out": multilateral lending "crowds out" investment from the private sector (foreign or domestic), thus having little or no impact on per capita income growth. Lucas (1990) and others have focused on this point. A related issue is the "fungibility" problem: If the World Bank undertakes a project that would have been undertaken by the domestic government, does government consumption increase or does the government undertake investment projects with lower returns?

Project lending was the World Bank's primary method of aid distribution until 1979, when structural adjustment lending was started. Project lending reflected the belief that economic development was best achieved through a series of large projects constructed over an extended period of time. Along with the issue of fungibility, project lending faced other problems. The lag time between project proposal, evaluation, and final completion was quite long, and thus could not provide any immediate benefits. Domestic resources were often required in support of the project's construction and maintenance; these counterpart funds put added strain on developing countries. Beginning in the 1980s, lending shifted from project loans toward structural adjustment loans (SAL). SALs are not tied to particular projects, but are made to allow countries to adjust to balance of payments problems and typically involve concessions on the part of the borrower to move toward freer markets and trade liberalization. Many factors caused this change in direction: the rise of neoclassical political economy in the developed nations, the OPEC oil crises, and the failure of projects to return the desired benefits, particularly in alleviating poverty and redistributing income. The developing countries needed aid in a prompt and flexible form that would alleviate their balance of payments deficits; the result was the increased use of programme (nonproject) lending coupled with policy change conditions. Project lending has not ceased to exist (approximately 2/3 of all loans are still project-based); but the rationale is that the success of projects could be enhanced through economic liberalization (Mosely, Harrigan and Toye, 1991).

Harrigan and Mosley (1991) have empirically examined the macroeconomic impact of SAL participation in a cross-country framework. Because these loans have only recently been implemented, the empirical findings are ambiguous at best. Mosley, Harrigan and Toye (1991) model GDP growth as being influenced by current and one lag of SAL share of GDP, drawings of IMF finance as a percentage of GDP, investment share of GDP, some variables representing compliance with conditionality, and various other factors. They find no significant relationship between SALs and the growth rate of GDP. Because only recipient countries comprised the sample, the regression coefficients are biased. The World Bank study (1988) of adjustment lending examines the impact of SAL participation by correcting for the possibility of selection bias, then performing regression analysis on a set of countries containing both recipients and non-recipients.

They also find no strong evidence of a link between SAL participation and growth, but suggest that over time this effect may become clearer.

The paper begins with a brief overview of the underlying growth theory, then examines the effect of World Bank lending on growth using panel data for 124 countries from 1970 to 1985. The regression results find an ambiguous impact for World Bank lending: Its influence ranges from insignificant to distinctly negative effects on the growth rate of per capita GDP. Further work on selectivity bias is a priority in future research.

Basic Theoretical Model

The theoretical model is a variant of the Solow model, where real per capita multilateral lending enters through investment in physical capital.

Variables, in per capita terms:

y - output
k - capital
i - gross investment
l - multilateral lending
g - government spending

Parameters:

α - elasticity of y with respect to k
δ - depreciation rate
η - population growth rate
s - savings rate

The production function is Cobb-Douglas:

$$y = k^{\alpha} \tag{3-1}$$

The capital-labor ratio rises if gross investment exceeds the amount required to keep pace with population growth and depreciation:

$$dk = i - (\delta+\eta)\, k \qquad (3\text{-}2)$$

Physical investment is financed by domestic savings and external multilateral lending. The term (y-g) is disposable income, so s(y-g) is domestic savings. Government expenditures include repayments on existing loans.

$$i = s(y-g) + l \qquad (3\text{-}3)$$

The growth rate of real per capita output is determined by the growth rate of the capital stock:

$$dy/y = \alpha(dk/k) \qquad (3\text{-}4)$$

By substituting equations (3-2) and (3-3) into (3-4):

$$dy/y = \alpha s(y/k) - \alpha s(g/k) + \alpha(l/k) - \delta - \eta \qquad (3\text{-}5)$$

The growth rate of per capita output depends positively on the ratios of internal and external financing to capital. Since capital stock is not observable, let the level of y proxy for the level of k:

$$k = y^{(1/\alpha)} \qquad (3\text{-}6)$$

Accounting for the fact that k is unobservable by substituting $y^{(1/\alpha)}$ for k in equation (3-6) gives

$$dy/y = \alpha s y^{-(1-\alpha)/\alpha} - \alpha s(g y^{-1/\alpha}) + \alpha(l y^{-1/\alpha}) - \delta - \eta \qquad (3\text{-}7)$$

As the level of y rises, the average product of capital falls, the ratio of savings to capital falls, and the growth rate declines. As the ratio g/y rises, the ratio of savings to capital falls, and the growth rate declines. When l/y rises, the ratio of external financing to capital rises, and the growth rate increases.

The Empirical Analysis of Economic Growth: An Overview

During the late 1960s and the 1970s, there were a number of empirical studies addressing the macroeconomic impact of development aid. These studies generally focused on two questions: (1) how did aid enter into the growth equation, and (2) did aid have a negative impact on domestic savings?[1] The results varied widely from study to study, raising doubts about the reliability of the estimated aid effects. In recent years, there has been renewed interest in what causes the growth of per capita income to vary across countries. A number of empirical studies have examined various macroeconomic determinants of long-term growth.[2] None of these studies includes external public finance as an explanatory variable.

The econometric problems that the early studies of the aid-growth relationship encountered and that need to be addressed are (1) what is the appropriate measure of lending/aid, (2) given the multicollinearity among regressors in the growth equation, what is the appropriate specification, (3) does simultaneity bias exist, and if so, is a simultaneous-equation system estimable, and (4) does aid have an effect that can actually be detected at the macro level?[3]

---

[1] Examples in the literature are work by Papenek (1973), Gupta (1975), Mosley (1980), Bowles (1987), Levy (1987), and Snyder (1990).

[2] Some recent examples are Barro and Lee (1993), Mankiw, Romer and Weil (1992), and Kormendi and Meguire (1985).

Obviously, if external public lending is expected to have minimal macroeconomic effects, trying to estimate growth rate equations with lending may be an exercise in futility. There is mixed evidence on this point: the aid to GDP ratios for most countries are so small that the macro effect should be undetectable; on the other hand, single country micro-level analyses indicate positive effects from project lending. Part of the problem is the prevailing use of cross-country data in estimating the effects on growth. Large countries and countries that receive little aid should show no effects, while countries experiencing large aid flows that vary significantly over time should exhibit large effects. Although cross-country data may have its drawbacks, a major benefit is the ability to make generalizations about the overall determinants of growth.

The second major question of interest is what is the appropriate measure of aid? Most studies use DAC data to generate the aid series, which shows disaggregated net disbursements and commitments. Unfortunately, the OECD does not (yet) provide the entire time series in a computer-readable format. An alternative source for the aid series is the World Bank debt tables; one can extract the disbursement series for concessional and non-concessional multilateral loans. This generates an aid series back to 1970, and is the measure that will be used for our estimates.

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[3] White's (1992) paper gives an excellent overview of the aid-macro relationship.

The problems of multicollinearity, measurement error, and simultaneity bias in empirical estimates of growth models have received greater attention within the last ten years. Levine and Renelt (1992) discuss the problem of ill-conditioning and misspecification of the growth regression, and suggest a methodology for assessing the sensitivity of the regression to the information set. Recent work by Barro (1993) and Arcand and Dagenais (1994) utilize instrumental variable techniques to correct for measurement errors in the data. Relatively little work has been done in the area of simultaneity bias with respect to growth and aid; Gupta and Islam (1983) try to use demographic variables to reduce the degree of simultaneity between aid and other right-hand side variables, yet they include aid as an exogenous variable. The general belief in the aid-growth literature is that aid is independent of output growth, but growth rates may be affected by variables that simultaneously influence the lending decision.

World Bank Lending and Growth: Empirical Analysis

Description of Data Set

The data used in the empirical analysis have been accumulated from three primary sources: the Penn World Table (Mark 5), the World Debt Tables, and the Social Indicators of Development. All of these data sets are readily available; for further information on the derivation of each, consult the referenced articles.

Per capita GDP growth rates and levels, per capita gross domestic investment, growth rate of government expenditures, rate of population growth, and price indices are from Penn World Table 5. Data on male and female school enrollment ratios and life expectancy at birth are 1970 and 1978 values from Social Indicators of Development. World Bank lending is represented by IDA and IBRD disbursements share of per capita GDP, adjusted to 1985 constant international dollars. IDA lending is concessional in nature, containing 25 percent or greater grant element.

One caveat to keep in mind about cross-country data is the variation in data quality across countries. Often times there are missing observations or highly inaccurate readings; these measurement errors tend to be correlated with the level of development.

Descriptive Statistics for Sample Countries

Tables 3-1 through 3-5 present some statistics for the sample countries over two time subsamples: 1970-78 and

1979-85. Columns show the mean annual level or growth rate for the cited variable over the stated time period. School enrollment, life expectancy and initial GDP level are values for the first year of the time subsamples.

Table 3-1 contains statistics for all countries within the time subsamples, 106 for 1970-78 and 92 for periods 1979-85. The data indicate that annual GDP growth was highest during the 1970-78 period, averaging 2.5 percent, then declining to 0.24 percent over 1979-85. The most notable results concern school enrollment ratios, with secondary school enrollments increasing by 30 percent and primary school enrollments increasing 15 percent on average.

Table 3-2 gives results for countries who received World Bank concessional and non-concessional loans. Seventy-two countries out of the 124 sampled were recipients during the period 1970-78 and 66 were recipients from 1979-85. Annual disbursements per capita are adjusted for changes in purchasing power parity and are in 1985 international dollars. Loan data prior to 1970 were not available from the World Bank. Table 3-3 reviews the same statistics for the 34 (26) nonrecipient countries.

Nonrecipient countries grew at an average annual rate of 2.62 percent, as compared to a rate of 2.47 percent for recipient countries. Nonrecipient countries had investment shares approximately seven percent higher than recipient countries, while recipient countries had government shares 4 to 5 percent higher than the nonrecipient countries. It is interesting to note, though, that the growth rate of government shares has declined most dramatically in the recipient countries. To what degree this effect is related to the conditions recently imposed by the World Bank on recipients might be of further interest. Tables 3-4 and 3-5 contain descriptive statistics for above-average and below-average per capita incomes for the time periods 1970-78 and 1979-85. Most notable is the increased school enrollment ratios during the 1978-85 period for the below-average per capita income countries and the decline in the growth rate of government share in the high income countries.

Regression Results for Growth Rates

In this section, we explore the empirical determinants of growth. Of particular interest is the impact of World Bank lending on average annual growth rates of recipient countries. The sample contains 124 countries, 72 of which were loan recipients over the period 1970-79 and 66 of which were recipients from 1979-85. The empirical results are obtained through regression on the period average, unless otherwise noted. This technique is common in the empirical growth literature. The common specification for the growth equations is of the form

$$Y = \alpha + \beta_1 GDP_{initial} + \beta_2 I + \beta_3 \, Pop + \beta_4 \, Govt + \gamma Z + u$$

where Y represents per capita GDP growth, $GDP_{initial}$ is the level of per capita GDP at the beginning of the period, I is investment share of per capita GDP, POP is the population growth rate, GOVT is the growth rate of government share of GDP, and Z is a set of other variables of interest.

In keeping with the recent empirical literature that has focused on the effects of measurement error in the data, instrumental variable techniques are performed. Three-stage least squares and generalized method of moments estimators are obtained utilizing a set of various instruments; these instruments include lagged averages and higher order terms.

OLS, 3SLS, and GMM with Participation Effects

Table 3-6 shows the regressions for annual average growth rates of per capita real GDP, controlling for those countries who were loan recipients. To correct for potential heteroscedasticity across countries, the standard errors for the coefficients are from White's (1980) heteroscedasticity-consistent covariance matrix.

Regression 6.1 is the most basic growth regression, relating per capita GDP growth to the initial level of per capita GDP, the per capita investment share of GDP, government share of GDP, the population's growth rate, secondary school enrollment ratios, and dummy variables for Sub-Saharan Africa, Latin America, the OECD countries, and those countries receiving concessional and nonconcessional loans. These regressors explain about 18-23% of the deviation from the mean (pooled) growth rates.

The variable log(GDP) is the log-level of per capita GDP in 1970 and 1979 respectively. It is included in the regression to capture the "convergence effect": countries with relatively lower per capita GDP will grow faster, given the absence of other determinants of growth. The coefficient on log(GDP) is -.0146, suggesting that convergence occurs at a rate of 1.38 percent per year.[4]

The coefficient on per capita investment share is positive and significant, reaffirming the role of investment in promoting growth. A 10 percent increase in GDP devoted to investment produces a 0.09 percent increase in the annual growth rate of per capita GDP. The government's share of GDP is negative but insignificantly related to the average growth rate. Population growth has a significantly negative effect on per capita GDP growth; a 1 percent increase in the population growth rate lowers annual GDP growth by 0.24 percent.

Human capital investment in each country is proxied by school enrollment ratios. There are some drawbacks to enrollment ratios, namely that they have a tendency to double-count school repeaters.[5] This double-counting of school repeaters will inflate primary school enrollments in less developed countries relative to the developed countries. School enrollment ratios are readily available, though, and are included in each regression. The secondary school enrollment ratio enters the regression insignificantly positive, which is puzzling. Even with instrumental variable techniques to correct for measurement error, this finding persists.

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[4] The formula for rate of convergence is $\frac{(1-e^{-\beta t})}{t} =$ coefficient estimate on log(GDP).

Dummy variables for sub-Saharan African, Latin American, and OECD countries are included in the regression equations. Past empirical and anecdotal evidence would dictate a negative relationship between growth rates and the sub-Saharan Africa and Latin America regional effects; the regression results support these conclusions. Sub-Saharan African countries are estimated to grow 2 to 4 percent slower and Latin American countries to grow 1 percent slower annually than sample average. It should be noted that the Latin American result is diminished when IV techniques are utilized, while the OECD countries exhibit a positive regional effect. The existence of three regional dummies creates a significant amount of collinearity; we will turn to this problem next.

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[5] A school enrollment ratio is the percentage of eligible children (by age group) enrolled in school, either primary or secondary.

Lastly are the dummy variables indicating whether the countries receive concessional and/or nonconcessional loans. The division between nonconcessional and concessional loans was made under the belief that the recipients of these types of loans would be different; empirically, they are the same (correlation coefficient = 95%). The sign of the participation dummies is negative but insignificant, indicating that there is no statistical evidence of higher per capita GDP growth for loan recipients. Additional regressions testing the interaction of participation with the other explanatory variables were performed; the results suggest no interaction.

Table 3-7 follows the same basic format as Table 3-6, but removes the effect of the OECD dummy, includes primary school enrollment as a regressor, and condenses World Bank loan participation into one dummy variable. As a result, population growth has a more significant negative impact on per capita GDP growth, while secondary school enrollment has a significantly positive effect on growth. A strange result is the continued decline in the significance of the Latin American dummy, while primary school enrollment becomes significantly negative.

One possible explanation for the negative coefficient on primary school enrollment relates back to the discussion of measurement errors: enrollment ratios that are unusually high, sometimes greater than 100 percent, for middle income countries. The double-counting phenomenon thus mitigates the efficacy of primary school enrollment ratios.

The dummy variable indicating a loan recipient enters significantly negative in the growth regression when IV techniques are utilized. These results suggest a rather unrealistic picture: A recipient is estimated to grow an average of 1.5 to 3 percent slower per year than a nonrecipient. A review of the descriptive statistics suggests that this is not the case.

Above-Mean Versus Below-Mean Per Capita Income Nations

The sample of 124 countries was divided in half; those countries with a level of per capita GDP in 1970 above the sample mean were considered "above-mean" and those below the sample mean labeled "below-mean". Regressions were fitted to each income group for both time subsamples. Each regression contains the basic explanatory variables: the log-level of 1975 GDP, mean per capita investment, government share of GDP, the population growth rate, secondary school enrollment, primary school enrollment, and dummy variables indicating Latin America, Sub-Saharan Africa and World Bank loan recipients.

Table 3-8 contains the regression results. The convergence term is significant at the 1 percent level for above-mean income countries and is marginally insignificant for below-mean income countries. This suggest that within the high initial income group, convergence has occurred at a rate of 1.76 percent per year. Investment per capita is positive, but insignificant for both groupings. Growth rate of government's share, population growth, school enrollment ratios, and the dummy for loan recipients are all insignificant in the regressions on the above-mean income countries. Coefficients on the variables indicating sub-Saharan Africa and Latin America are significantly negative, indicating that within the above-mean income sample, these countries grow on average 1.1 percent and 1.7 percent slower respectively.

In contrast to the results for the above-mean countries, the major influences on the below-mean income countries are the population growth rate and the school enrollment ratios. Once again, the unusual, significantly negative coefficient on primary school enrollment reappears. This finding is robust the exclusion of secondary school enrollment ratio from the regression. The dummy for sub-Saharan Africa is negative and significant, while the coefficient on Latin America is insignificant. The sub-Saharan African countries tended to grow 1.9 percent slower than the other below-mean countries.

The dummy variable indicating loan recipients was positive, but insignificant, for these countries. This result should be treated cautiously; since per capita income level is a major determinant of World Bank lending, the group labeled "low income" will consist predominantly of recipients. As a result, the estimated coefficient on the recipient dummy will tend toward zero. By removing the level of per capita GDP from the regression, the recipient dummy becomes significantly positive for the above-mean group and remains insignificant for the below-mean group.[6]

Conclusions

All of the empirical results indicate an ambiguous relationship between World Bank lending and long run GDP growth. It may be that the effects of multilateral lending do not enter the growth regression explicitly, but impact variables such as education, openness, government share of GDP, and others. An analysis of program effects reveals no interaction, but this may change as lending conditions focus on economy-wide policy changes.

The results do support some findings in the empirical growth literature: Increases in investment share and the secondary school enrollment ratio are positively related to growth, while population growth is negatively related. Regional dummies do pick up effects not accounted for by the other explanatory variables; Latin America, and in particular, sub-Saharan Africa are growing significantly slower than the sample average.

In contrast, the results do not support the findings of Barro (1991) and Barro and Lee (1993) that increases in government's share of GDP is negatively related to growth. The coefficients on this term remain insignificant regardless of estimation technique. An unusual result is the unexpectedly negative coefficient on primary school enrollment, even when secondary school enrollment is excluded from the regression.

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[6] It should be noted that the insignificance of the coefficient for the below-mean group is mainly due to the adjustment of the standard error for heteroscedasticity.

Further investigation of the impact of World Bank lending by correcting for any selection bias is the logical next step in this area. Also of interest would be the incorporation of other measures of educational attainment into the empirical growth literature, given that the school enrollment ratios suffer from a number of data problems.

Table 3-1: Descriptive Statistics for Sample Countries

	1970-78	1979-85
GDP Growth Rate	2.50	0.24
Initial Level of Per Capita GDP[a,c]	2118	2504
Population Growth Rate	2.32	2.20
Investment Share of Per Capita GDP	19.31	18.38
Government Share of Per Capita GDP	18.11	19.10
Growth Rate of Government Share	1.58	0.85
Life Expectancy at Birth, in years[a]	56	59
Enrollment Ratio, Primary[a,b]	78.22	85.95
Female Enrollment Ratio, Primary[a,b]	71.57	80.13
Enrollment Ratio, Secondary[a,b]	31.24	41.27
Female Enrollment Ratio, Secondary[a,b]	28.17	38.59

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124 countries in sample. Because of missing data, the 1970-78 statistics are based on 106 countries and the 1979-85 statistics are based on 92 countries.

[a] Figures are from the initial year for the two subsamples. All other values are subsample annual averages.

[b] Enrollment ratios are percentage of eligible children enrolled. Because of school repeaters, enrollment ratios above 100 percent are possible.

[c] Values are in 1985 international dollars.

Table 3-2: Descriptive Statistics for Countries Receiving Concessional and Nonconcessional World Bank Loans

	1970-78	1979-85
GDP Growth Rate	2.47	0.29
Initial Level of Per Capita GDP[a,c]	1333	1556
Population Growth Rate	2.47	2.50
Investment Share of Per Capita GDP	16.99	16.23
Government Share of Per Capita GDP	19.62	20.09
Growth Rate of Government Share	1.38	0.66
Life Expectancy at Birth, in years[a]	51	55
Enrollment Ratio, Primary[a,b]	70.16	80.82
Female Enrollment Ratio, Primary[a,b]	62.54	73.59
Enrollment Ratio, Secondary[a,b]	20.21	29.61
Female Enrollment Ratio, Secondary[a,b]	16.97	26.04
Concessional Disbursements, as a Share of Per Capita GDP[c]	0.0014	0.0038
Nonconcessional Disbursements, as a Share of Per Capita GDP[c]	0.0012	0.003

1970-78: 72 observations. 1979-85: 66 observations.

[a] Figures are from the initial year for the two subsamples. All other values are subsample annual averages.

[b] Enrollment ratios are percentage of eligible children enrolled. Because of school repeaters, enrollment ratios above 100 percent are possible.

[c] Values are in 1985 international dollars.

Table 3-3: Descriptive Statistics for Nonrecipient Countries

	1970-78	1979-85
GDP Growth Rate	2.62	0.09
Initial Level of Per Capita GDP[a,c]	5650	8380
Population Growth Rate	2.00	1.46
Investment Share of Per Capita GDP	24.22	23.86
Government Share of Per Capita GDP	14.90	16.57
Growth Rate of Government Share	2.00	1.37
Life Expectancy at Birth, in years[a]	65	70
Enrollment Ratio, Primary[a,b]	95.29	99.00
Female Enrollment Ratio, Primary[a,b]	90.70	96.73
Enrollment Ratio, Secondary[a,b]	54.59	70.88
Female Enrollment Ratio, Secondary[a,b]	51.88	70.42

1970-78: 34 observations. 1979-85: 26 observations.

[a] Figures are from the initial year for the two subsamples. All other values are subsample annual averages.

[b] Enrollment ratios are percentage of eligible children enrolled. Because of school repeaters, enrollment ratios above 100 percent are possible.

[c] Values are in 1985 international dollars.

Table 3-4: Descriptive Statistics for Countries with Above-Mean Per Capita Income

	1970-78	1979-85
GDP Growth Rate	4.60	2.47
Initial Level of Per Capita GDP[a,c]	2516	2720
Population Growth Rate	2.12	1.86
Investment Share of Per Capita GDP	21.85	20.59
Government Share of Per Capita GDP	16.05	18.42
Growth Rate of Government Share	1.42	0.50
Life Expectancy at Birth, in years[a]	60	62
Enrollment Ratio, Primary[a,b]	87.53	90.08
Female Enrollment Ratio, Primary[a,b]	82.40	84.73
Enrollment Ratio, Secondary[a,b]	34.76	48.15
Female Enrollment Ratio, Secondary[a,b]	31.16	45.44

1970-78: 58 observations, with 36 countries being World Bank loan recipients. 1979-85: 52 observations, with 34 countries being loan recipients.

[a] Figures are from the initial year for the two subsamples. All other values are subsample annual averages.

[b] Enrollment ratios are percentage of eligible children enrolled. Because of school repeaters, enrollment ratios above 100 percent are possible.

[c] Values are in 1985 international dollars.

Table 3-5: Descriptive Statistics for Countries with Below-Mean Per Capita Income

	1970-78	1979-85
GDP Growth Rate	-0.002	-2.67
Initial Level of Per Capita GDP[a,c]	1721	2248
Population Growth Rate	2.55	2.64
Investment Share of Per Capita GDP	16.25	15.52
Government Share of Per Capita GDP	20.59	19.98
Growth Rate of Government Share	1.78	1.32
Life Expectancy at Birth, in years[a]	52	56
Enrollment Ratio, Primary[a,b]	66.97	80.60
Female Enrollment Ratio, Primary[a,b]	58.50	74.15
Enrollment Ratio, Secondary[a,b]	26.98	32.32
Female Enrollment Ratio, Secondary[a,b]	24.56	29.66

1970-78: 48 observations, with 36 countries being World Bank loan recipients. 1979-85: 40 observations, with 31 countries being loan recipients.

[a] Figures are from the initial year for the two subsamples. All other values are subsample annual averages.

[b] Enrollment ratios are percentage of eligible children enrolled. Because of school repeaters, enrollment ratios above 100 percent are possible.

[c] Values are in 1985 international dollars.

Table 3-6: Regressions on Growth Rate of Real Per Capita GDP

	(6.1)	(6.2)	(6.3)
Constant	0.1246	0.1837	0.2753
	(3.94)	(3.92)	(4.23)
Log(GDP)[a]	-0.0146	-0.0227	-0.0347
	(-3.65)	(-4.06)	(-4.81)
I/GDP	0.0009	0.0012	0.0017
	(3.05)	(3.96)	(3.62)
G/GDP	-0.0002	-0.0003	-0.0003
	(-0.71)	(-0.87)	(-0.66)
Population Growth	-0.2401	-0.1048	-0.2625
	(-1.73)	(-0.72)	(-1.07)
Secondary School Enrollment	0.0012	0.0014	0.0017
	(0.82)	(0.96)	(1.23)
Latin America	-0.0128	-0.0081	-0.0016
	(-2.09)	(-1.21)	(-0.22)
Africa	-0.0258	-0.0296	-0.0340
	(-3.72)	(-3.89)	(-4.06)
OECD	0.0046	0.0118	0.0175
	(0.62)	(1.35)	(2.06)
Dummy, Concessional	0.0171	0.0099	-0.0001
	(1.44)	(0.80)	(-0.001)
Dummy, Nonconcessional	-0.0169	-0.0164	-0.0178
	(-1.49)	(-1.44)	(-1.66)
R-squared	0.18	0.17	0.14
	0.23	0.21	0.19

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[a] Log(GDP) is the logarithm of initial GDP per capita for each time subsample.

Note: (6.1) are the OLS estimates, (6.2) are the three-stage least squares estimates using all instruments on both equations, and (6.3) are the GMM estimates using select instruments for each equation. All t-statistics are heteroskedasticity-consistant.

Table 3-7: Regressions With Condensed Participation Dummy

	(7.1)	(7.2)	(7.3)
Constant	0.1407	0.2299	0.3737
	(4.59)	(4.93)	(4.77)
Log(GDP)[a]	0.0156	-0.0264	-0.0454
	(-4.51)	(-5.31)	(-4.81)
I/GDP	0.0009	0.0012	0.0019
	(3.05)	(3.57)	(3.37)
G/GDP	-0.0003	-0.0002	-0.0002
	(-0.77)	(-0.39)	(-0.41)
Population Growth	-0.2624	-0.1636	-0.5754
	(-2.02)	(-1.23)	(-2.70)
Secondary School Enrollment	0.0027	0.0043	0.0057
	(1.46)	(2.48)	(3.24)
Primary School Enrollment	-0.0024	-0.0039	-0.0037
	(-1.28)	(-2.21)	(-1.99)
Latin America	-0.0133	-0.0102	-0.0031
	(-2.51)	(-1.74)	(-0.45)
Africa	-0.0263	-0.0334	-0.0464
	(-3.76)	(-3.75)	(-4.40)
Dummy for Loan Recipients	-0.0016	-0.0143	-0.0339
	(-0.28)	(-2.03)	(-3.26)
R-squared	0.19	0.18	0.14
	0.23	0.18	0.16

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[a] Log(GDP) is the logarithm of initial GDP per capita for each time subsample.

Note: (7.1) are the OLS estimates, (7.2) are the three-stage least squares estimates using all instruments on both equations, and (7.3) are the GMM estimates using select instruments for each equation. All t-statistics are heteroskedasticity-consistant.

Table 3-8: Regressions For High and Low Per Capita Income Countries

	High Income	Low Income
Constant	0.1810 (4.88)	0.0664 (1.98)
Log(GDP)[a]	-0.0189 (-4.80)	-0.0067 (-1.72)
I/GDP	0.0005 (1.55)	0.0003 (1.19)
G/GDP	-0.0002 (-0.65)	0.0003 (0.73)
Population Growth	-0.1741 (-0.81)	-0.1898 (-1.34)
Secondary School Enrollment	0.0022 (0.73)	0.0032 (1.47)
Primary School Enrollment	-0.0005 (-0.17)	-0.0055 (-2.62)
Latin America	-0.0110 (-2.04)	-0.0107 (-1.10)
Africa	-0.0172 (-2.25)	-0.0197 (-3.03)
Dummy for Loan Recipients	-0.0046 (-0.86)	0.0032 (0.238)
R-squared	0.10 0.24	0.27 0.16

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[a] Log(GDP) is the logarithm of initial GDP per capita for each time subsample.

Note: Results are from ordinary least squares. All t-statistics are heteroskedasticity-consistant.

CHAPTER 4
FLORIDA CONSUMER CONFIDENCE AND ITS USE IN FORECASTING AUTOMOTIVE EXPENDITURES

Introduction

Since the 1990-91 recession, there has been renewed interest among economists over the role of consumer confidence and its impact on macroeconomic behavior. The recent recession was popularly blamed on a collapse in consumer confidence following the Iraqi invasion of Kuwait and the United State's military involvement. Similarly, the prospect of a military victory over Iraq was though to have triggered a positive wave of consumer confidence that led the economy out of the recession. The Michigan Index of Consumer Sentiment, compiled by the Survey Research Center at the University of Michigan, has led previous business cycles and some of its components are classified as leading indicators; it is not unreasonable to believe that swings in consumer sentiment could influence the business cycle. It is also possible, though, that consumer sentiment may be a reflection of other economic factors that are changing over the business cycle and is therefore not the direct cause of the cyclical fluctuations.

The use of statewide consumer confidence measures in examining the business cycle and in forecasting durables expenditures are a new approach. Since households are likely to be more affected by regional economic factors, it seems reasonable to expect that a statewide consumer confidence index should have greater explanatory power over the national index in the determination of statewide durables expenditures. But there is an issue of whether the state consumer confidence index reflects more of a national view, as respondents' answers might be overly flavored by national events. This paper analyzes how well one statewide measure of consumer confidence, the Florida Economic and Consumer Survey's consumer confidence index, forecasts monthly automotive expenditures. Also examined is whether the index components are more effective in forecasting versus the total index, and how well the forecasts do over the periods relating to involvement in the Gulf War and the post-Gulf War period. Finally, the paper examines whether the Florida consumer confidence index or any of its components has any explanatory power when the Michigan Index of Consumer Sentiment is included in the regression on statewide automotive expenditures.

Background of Consumer Confidence Surveys

Since the 1950s, surveys have been used to construct measures of consumer confidence. This consumer psychology approach was pioneered by George Katona of the University of

Michigan. According to psychological economics, expenditures depend on the willingness to buy in addition to the ability to buy. This willingness to buy depends on both economic and noneconomic factors, some of which may be unobservable. The implication of the theory of psychological economics is that consumer reaction to changes in income or wealth will fluctuate over time with changes in attitudes.

This idea flies in the face of conventional economic theory, which assumes that consumers behave consistently over time to any changes in wealth or income. At any given point in time, any effects that may arise from changes in consumer attitudes are assumed to cancel each other out through aggregation. But if similar circumstances affect enough households in the economy in the same manner, the consumer attitude effect may not be removed when the data are aggregated. If this is the case, the consumer confidence measure might appear related to the macroeconomic variables, and seem to cause economic fluctuations.

One of the major issues regarding the use of consumer confidence data is what consumer confidence really measures. Does consumer sentiment reflect buying intentions separate from the contemporaneous changes in other economic variables, as was the view of Katona, or is it simply a sufficient statistic for the information already contained in current economic conditions? If consumer attitudes are a reflection of the state of the economy, then the inclusion of variables like income and employment in the forecast of consumer purchases should remove the predictive power of the consumer confidence measure. On the other hand, if psychological factors capture more than the current economic condition, confidence should remain robust to the inclusion of these extra variables.

A second view of consumer sentiment is that it measures expectations about future economic activity. Thus, consumer confidence might contain the future economic information that is critical to the life-cycle and permanent income theories of consumption. In both theories, expected future income influences current consumption. This suggests that consumer confidence measures will be significant in the prediction of consumption expenditures even in the presence of concurrent economic variables.

A third view of consumer confidence is that it measures consumers' uncertainty about their current and future economic status. Greater uncertainty about future economic conditions, such as an increased probability of job loss, will cause individuals to be pessimistic about the future and result in households postponing purchases of discretionary items. Consequently, spending on consumer durables like automobiles should be negatively related to measures of consumer confidence.

Measures of Consumer Confidence

There are two major measures of consumer confidence at the national level, the Michigan Index of Consumer Sentiment and the Conference Board's Consumer Confidence Survey. Since 1955, the Michigan Index has contained five questions that enter into the calculation of the total index with equal weight. The specific questions are

1. "We are interested in how people are getting along financially these days. Would you say that you (and your family living there) are better or worse off financially than a year ago?"

2. "Now looking ahead--do you think a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?"

3. "Now turning to business conditions in the country as a whole--do you think that the next 12 months will have good times financially, or bad times or what?"

4. "Looking ahead, which would you say is more likely--that the country as a whole will have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?"

5. "About the big things people buy for their homes--such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think that now is a good or a bad time for people to buy major household items?"

The Florida Consumer Confidence Index is patterned after the Michigan Index of Consumer Sentiment and has been conducted since 1985. Each month, one thousand adult individuals are surveyed by phone through random digit dialing. The responses to each survey component are formed into an index, then the component indices are weighted and used in forming the total confidence index. Since September

1993, the Florida Consumer Confidence Survey has become more refined geographically with the calculation of component and total consumer confidence indices for the three major regions in Florida.

The correlation matrix in Table 4-1 shows that there is a high degree of correlation between the index components of the Florida Consumer Confidence Index. The component correlations for Florida mirror those found at the national level, but with a lower correlation between the expected five year national business climate and the other components (Throop, 1992). Also included in Table 4-1 are two non-index questions pertaining directly to consumer buying plans. The approach of psychological economics suggests that expenditures on large, discretionary items like automobiles and homes should be most effected by changes in consumer confidence since consumers can delay their purchases until economic conditions improve or are expected to improve. Table 4-1 suggests that there may be more factors influencing buying intentions for these items than can be explained by the component indices of consumer confidence. Note that the correlations between the two buying intention questions and the component questions are positive and significant, but are not as highly correlated as traditional economic theory might expect.

Empirical Literature on the Role of Consumer Confidence

Since the 1950s, economists have been interested in using consumer sentiment data in forecasting durable goods expenditures; and from the beginning, the usefulness of this data has been in question. A study by Mueller (1963) found that the Michigan Index of Consumer Sentiment was statistically insignificant in regressions on durable goods expenditures until income measures were added as explanatory variables. Other work by Friend and Adams (1964) concluded that stock prices and hours worked per week could displace the explanatory power of consumer sentiment. Juster and Wachtel (1972) studied how well a model using purchase anticipations fared against a stock adjustment model of durable goods demand. They found that when purchasing decisions and consumer sentiment are measured with accuracy, the anticipations model performed as well as the stock adjustment model. Burch and Stekler (1969) analyzed the performance of consumer confidence in signaling turning points in consumer expenditures and found that consumer confidence predicted many false signals in durable good expenditures. Burch and Gordon (1984) found that the Michigan Index of Consumer Sentiment is of limited usefulness in explaining durable goods spending when other economic variables are included in the predictive equation, and that the individual components seem to have as much explanatory power as the combined index of sentiment. In total, these mixed results suggest that consumer confidence reflected information already contained in other economic data and was superfluous.

The literature on consumer sentiment was invigorated after the 1990-91 recession and the Gulf War, when the sudden decline in consumer confidence was widely blamed for worsening the recession. Again, the debate focuses on whether consumer confidence measures contribute explanatory power in forecasting consumer expenditures, given the information provided by economic variables. Articles by Garner (1991) and Leeper (1992) concludes that consumer sentiment is a proxy for observable economic information; therefore, it is not useful in forecasting. Garner does point out that around unpredictable, exceptional circumstances like the Gulf War, confidence measures may be advantageous.

On the opposite side are those finding that consumer confidence exhibits some idiosyncratic predictive power. Throop (1992), Fuhrer (1993), and Carroll, Fuhrer, and Wilcox (1994) all find consumer sentiment measures strongly related to durable goods expenditures after accounting for the influence of other economic variables. Throop and Fuhrer utilize vector error-correction and vector autoregression techniques to control for spurious relationships and endogeneity questions, while the article by Carroll, Fuhrer, and Wilcox uses the more traditional distributed lag effect of consumer sentiment on durables expenditures.

Data and Empirical Framework

The empirical studies of consumer confidence on the national level suggest that these measures should improve forecasts of durable goods expenditures during the Gulf War period. To test this hypothesis at the state level, I will examine several different forecasting models and their fit as measured by the root mean squared error at different points in time. Before model estimation, though, an examination of the individual data series is necessary.

In the past, particularly in the 1960s literature on consumer confidence, it was popular to regress the level of durables expenditures on the level of some consumer confidence index, income level, unemployment, stock prices and various other regressors. These regressions seemed to exhibit very good fit as established by statistical measures like the R-square, but did not perform particularly well in the forecast of durables expenditures. Further examination revealed that the residuals from these regressions were highly autocorrelated; the variables in their levels form contained trends that produced a spurious, or false, statistical relationship. To prevent this problem, the data series need to be tested for unit roots using the augmented Dickey-Fuller Test (Greene, 1993).

Table 4-22 contains the augmented Dickey-Fuller (ADF) tests for the monthly and the quarterly series. The ADF test is a F-test where the null hypothesis is one of a unit root. Failing to reject the null hypothesis of a unit root means that the series is nonstationary, and might cause these spurious relationships to arise. When using the ADF test, it is critical to utilize the special ADF tables and not the standard F-tables, since failing to do so will cause the null hypothesis to often be rejected while a unit root is present. For the sample size, the critical value of the ADF test is 6.73; in the monthly data, only one series, the logarithm of the 90-day commercial paper rate (LCOM90) is nonstationary. After differencing the series, the new variable, the percentage change in the 90-day commercial paper rate, is also found nonstationary. The next step is to difference the percentage change variable. The result, the rate of percentage change in the 90-day commercial paper rate, is stationary. All the ADF tests on the quarterly data indicate the presence of unit roots.

Forecasting Models and Results

Four models are fit on the monthly data spanning from January 1985 to December 1989. The models are listed in Table 4-3. The dependent variable in all the models is the logarithm of statewide automotive taxable sales in current dollars. The first model assumes that the current month's automotive sales are just a function of last month's sales and some constant term. The second model includes a constant term plus a twelve month unrestricted distributed lag of the log-level of the Florida Consumer Confidence Index (LCCI). The third model is like the second one, but adds a twelve-month unrestricted distributed lag for the log-level of statewide employment as determined by claims for unemployment insurance and a six period unrestricted distributed lag for the rate of percentage change in the 90-day commercial paper rate. The last model drops the consumer confidence lag structure and looks at the contributions of the purely economic variables.

The regression results seem to suggest that consumer confidence does have an idiosyncratic role, but not one that is in line with the theory. The sum of the coefficients on the lagged employment variable is positive and significant, indicating that increases in employment lead to increases in automotive expenditures; but the sum of the coefficients on lagged consumer confidence is negative and significant. Interpreting this literally suggests that increases in consumer confidence lead to declines in automotive group expenditures. Although this model seems to have the best fit as indicated by its R-square, the negatively significant parameter on the distributed lag of consumer confidence should be viewed with caution.

The four models were then used to forecast the period from January 1990 to March 1994. For the entire period, the last model (4-3.4) that excludes the distributed lag of the Florida Consumer Confidence Index seems to do the best job in the sense of minimizing the root mean squared error of the forecast (Holden, Peel, and Thompson, 1990). Over the pre-Gulf War period, the second model (4-3.2), which is a twelve month unrestricted distributed lag of the Florida Consumer Confidence, does very well. Unfortunately, during the Gulf War period and after, this model performs the worse, while models (4-3.1) and (4-3.4) seem to predict the best. In some sense, these models reflect the same thing: conventional economic theory suggests that durables purchases will be strongly affected by changes in employment, and hence, income. Lagged changes in employment will effect past values of automotive sales, which in turn partially predicts current automotive sales.

While this result seems to reflect the dominance of other economic variables over the consumer confidence measure, there remains the question about why consumer confidence entered significantly negative. The results from the national studies of consumer confidence found that consumer sentiment was most useful during the Gulf War period and after; why is this opposite for the Florida Consumer Confidence Index? There is no economic reason to believe that Floridians are somehow different from the rest of the nation. The best possible explanation is the lack of a long enough time series to estimate the relationship between consumer confidence and durables sales at the state level. Work by Adrian Throop (1992) indicates that with approximately thirty years of data, a cointegrating relationship is present between expenditures on durables and then Michigan Index of Consumer Sentiment. At the state level, only eight years of data are available, and half will go toward forecasting. This makes estimation of a well-specified model difficult.

Table 4.5 looks at how well the components of the Florida Consumer Confidence Index do in forecasting automotive group sales over the period 1990:1 to 1994:3. Employment is positive and significant in the determination of automotive expenditures, while the component questions have a range of effects. The current measures of confidence, (4-5.1) which measures the individual's current financial condition, and (4-5.4) which measures the current business conditions in the U.S., both enter into the regression equations significantly negative and do very poorly in the forecast of automotive expenditures. On the other hand, longer term measures of confidence like (4-5.2) which measures the individual's expected future financial condition, and (4-5.5) which measures future business conditions in the U.S. do very well in forecasting. The model containing buying condition for durable goods also does well in forecasting, but the subcomponent enters insignificantly into the forecasting equation.

A final point of interest is whether the state measure of consumer confidence contains relevant information that is not accounted for in the national index. Table 4-6 contains regression results on quarterly data for the full sample period. Note that this is not a forecasting exercise; there are not enough data at the quarterly frequency to produce good forecasts. The first regression contains a distributed lag of four quarters of the Florida Consumer Confidence index, along with the log-level of last quarter's automotive expenditures. The second regression contains a distributed lag of four quarters of the Michigan Index of Consumer Sentiment as the sentiment variable, while the last equation includes both the local and the national measure of consumer sentiment. The results suggest that the Florida Consumer Confidence Index and the Michigan Index essentially contain the same information and are not of use together in the regression equation.

Conclusions

The empirical results suggest that the Florida Consumer Confidence Index is not a very good predictor for use in forecasting statewide taxable sales in the automotive group. The relationship between Florida consumer confidence and automotive group expenditures appeared to break down during the Gulf War and the post-Gulf War period. The component questions of the Florida Consumer Confidence Index had mixed results in forecasting; the questions concerning current economic conditions did poorly compared with the questions concerning future economic activity. Finally, there may be no statistically significant information provided by using the Florida Consumer Confidence Survey in addition to the Michigan Index of Consumer Sentiment.

There are several potential topics for further study in this area. One possibility is to continue to replicate some the national study results for the Gulf War as more data become available. Another suggested area is the use of the individual response data to the Florida Consumer Confidence Index. By pursuing follow-up studies of buying behavior, greater understanding about the interaction between the individual's purchasing decision and the aggregate fluctuations in durables expenditures could be revealed.

Table 4-1: Correlations Among Components of the Florida Consumer Confidence Index

	CCI	CUR	FUT	US1	US5	HH6	YCAR[a]	YHOME[b]
CCI	1.00							
CUR	0.92	1.00						
FUT	0.87	0.80	1.00					
US1	0.96	0.80	0.79	1.00				
US5	0.68	0.55	0.63	0.60	1.00			
HH6	0.90	0.86	0.69	0.86	0.35	1.00		
YCAR	0.56	0.62	0.46	0.49	0.29	0.56	1.00	
YHOME	0.62	0.62	0.51	0.58	0.30	0.62	0.38	1.00

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[a] Non-index question from the Florida Economic and Consumer Survey. Reflects the percentage of "yes" responses to the question: "Do you plan to buy a house in the next six months?"

[b] Non-index question from the Florida Economic and Consumer Survey. Reflects the percentage of "yes" responses to the question: "Do you plan to buy a car in the next six months?"

Note: The five components of the Florida Consumer Confidence Index are the individual's current financial condition (CUR), the individual's future (expected) financial condition (FUT), expected business conditions in the U.S. over the next year (US1), expected business conditions in the U.S. over the next five years (US5), and current buying conditions for household durables (HH6). They are equally weighted in the computation of the overall measure of Florida's consumer sentiment, the Florida Consumer Confidence Index (CCI).

Data: The Florida Economic and Consumer Survey.

Table 4-2: Augmented Dickey-Fuller Tests for Stationarity

A. Monthly Data: 1985:1 to 1989:12

Variable	Test on Levels	Test on Differences
LSFLA	9.03**	----
LCCI	6.99*	----
LEFLA	7.36**	----
LCOM90	3.81	52.9**

B. Quarterly Data: 1985:1 to 1994:3

Variable	Test on Levels
LSFLA	1.79
LCCI	3.84
LEFLA	1.70
LCOM90	1.85
LMICH	2.64

---

* indicates statistical significance at the 5% level.

** indicates statistical significance at the 1% level.

Note: The variables tested are as follows: the logarithm of statewide automotive group taxable sales (LSFLA), the logarithm of the Florida Consumer Confidence Index (LCCI), the logarithm of statewide employment (LEFLA), the logarithm of the 90-day commercial paper rate (LCOM90), and the logarithm of the Michigan Index of Consumer Sentiment (LMICH).

Data: Data sources are the Florida Department of Revenue (LSFLA), The Bureau for Economic and Business Research at the University of Florida (LCCI), the Florida Department of Labor (LEFLA), and DRI/McGraw-Hill (LCOM90 and LMICH).

Table 4-3: Estimates of Forecasting Models for Monthly Taxable Automotive Expenditures in Florida

Independent Variables	4-3.1	4-3.2	4-3.3	4-3.4
Constant	3.58**	29.30**	5.40**	-5.40**
LSFLA(-1)[a]	0.75**	----	----	----
Sum(LCCI)[b]	----	-3.26**	-1.50**	----
Sum(LEFLA)[c]	----	----	1.03**	1.29**
Sum(COMDIF2)[d]	----	----	1.69**	0.80
Adjusted R-square	0.58	0.12	0.81	0.66
Durbin-Watson	2.50	1.02	2.01	2.25
Time period	85:2-89:12	[	86:2-89:12	]
Number of observations	59	[	47	]

** Denotes statistical significance at the 1% level. The standard errors and significance levels are heteroskedastic-consistent estimates.

[a] The logarithm of statewide automotive taxable sales, in current dollars, lagged one period.

[b] The sum of the coefficients on the twelve month unconstrained distributed lag of the logarithm of CCI.

[c] The sum of the coefficients on the twelve month unconstrained distributed lag of the logarithm of statewide employment.

[d] The sum of the coefficients on the six period unconstrained distributed lag of the rate of percentage change in the 90-day commercial paper rate.

Note: The dependent variable is the logarithm of monthly current dollar taxable sales in the automotive taxable sale catagory, as defined by the Florida Department of Revenue.

Table 4-4: Root Mean Squared Errors for the Forecasting Models

Time period	4-3.1	4-3.2	4-3.3	4-3.4
1990:1-1994:3	0.184	0.532	0.329	0.126
Pre-Gulf War 1990:1-1990:6	0.088	0.038	0.11	0.083
Gulf War 1990:7-1990:12	0.033	0.345	0.328	0.161
Post-Gulf War 1991:10-1991:12	0.021	0.759	0.574	0.105

Table 4-5: Estimates of Automotive Group Sales Forecast Equations using the Subcomponents of the Florida Consumer Confidence Index

Independent Variable	4-5.1	4-5.2	4-5.3	4-5.4	4-5.5
Constant	5.57	-7.06*	-3.79	7.97	-4.47*
Sum(LEFLA)	1.33**	1.28**	1.22**	0.73**	1.33**
Subcomponent Measure[a]	-2.57**	0.33	-0.11	-1.05**	-0.35*
Sum(COMDIF2)	1.61*	0.98	0.79	1.39*	0.43
Adjusted R-square	0.71	0.60	0.69	0.79	0.81
Durbin-Watson	2.16	2.16	1.69	2.04	2.39
RMSE[b] (90:1-94:3)	0.55	0.13	0.18	0.48	0.14

** Denotes significance at the 1% level.

* Denotes significance at the 5% level.

[a] The subcomponents for the individual regression equations are as follows: the individual's current financial condition (CUR) in (3.5.1), the individual's future expected financial condition (FUT) in (3.5.2), current buying conditions for household durables (HH6) in (3.5.3), expected business conditions in the U.S. over the next year (US1) in (3.5.4), and expected business conditions in the U.S. over the next five years (US5) is in (3.5.5).

[b] Root mean squared error for forecasted Florida automotive expenditures over the period 1990:1-1994:3.

Table 4-6: Regression Results for the Explanitory Power of the Florida Consumer Confidence Index and its Subcomponents in the Presence of a National Index

Independent Variable	4-6.1	4-6.2	4-6.3
Constant	4.78*	3.40*	11.73
LSFLA(-1)	0.74**	0.78**	0.62**
LCCI: (-1)	0.33	----	0.14
(-2)	-0.58*	----	-0.76
(-3)	0.21	----	-0.20
(-4)	-0.13	----	-0.43
LMICH:(-1)	----	0.22	0.45
(-2)	----	-0.56*	0.05
(-3)	----	0.29	0.58
(-4)	----	-0.14	0.12
R-square	0.69	0.71	0.71
Adjusted R-square	0.63	0.66	0.59
Durbin-Watson	2.60	2.63	2.59

---

* Denotes significance at the 5% level.

** Denotes significance at the 1% level.

CHAPTER 5
CONCLUSIONS

This dissertation has examined a wide range of topics in the field of macroeconomics, from monetary policy and interest rates to the use of consumer confidence measures in forecasting durable goods expenditures. The unifying theme is the emphasis on the use of econometric and statistical tools to test various theories or empirical regularities. As is the case with many studies, my findings indicate that there remain a number of unresolved issues in these specific areas.

The issue of liquidity effects from monetary policy during the Nixon administration might be addressed with a more sophisticated modelling technique like vector autoregression. The question of whether World Bank lending has any effect has received a lot of public attention recently, and there are new studies indicating the ineffectiveness of lending on the macroeconomic level. Another issue that needs to be addressed is the quality of cross-country data series. While this has steadily improved over time, there is still a long way to go. Finally, a feasible extension of the study of the Florida Consumer Confidence Index and its forecasting accuracy is to look at the panel data for the individual respondents and follow up on their purchase decisions. While there is a statistically positive relationship between consumer confidence and expenditures on durable goods at the macroeconomic level, this might not persist in the individual data. Studies on this paradox indicate that buying intentions are not good predictors of individual consumer behavior while the reverse is true in the aggregate data.

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BIOGRAPHICAL SKETCH

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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